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ABSTRACT

Learning activities and questioning skills that teachers in Tasmania can use to determine a child's mathematics understanding are presented. Covered topics include division, multiplication, subtraction, addition, sorting and classification, one-to-one correspondence, patterns, ordering, and counting. Included for each topic are the aim, needed materials, an initial activity, observations and further activities and suggestions for observations. Questions that can be used to assess learning are included in the last two sections. (KR)

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ASSESSING CHILDREN'S LEARNING IN MATHEMATICS K-3

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DIVISION 1

AIM

To explore the child's level of operation in relation to the quotition (how many) aspect of division.

MATERIALS

Readily available counting materials or objects around which a story problem could be created.

INITIAL ACTIVITY

Use a story problem to present a simple quotition division. For example: 'How many wheels does a billy cart have? I have 12 wheels. How many carts can I make?'

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child recognise this as a repeated subtraction?

Does the child model the situation in any way?

If so, how does the child do this:

- By using objects?
  - Does the child make the collection of 12, and then make the groups?
  - Does the child make the groups until a total of 12 are used?
  - What does the child say about the model?
- By a drawing?

Does the child solve the problem using a mental strategy?

What strategy does the child use:

- Visualising the situation?
- Addition or subtraction of equal groups?
- Knowledge of the appropriate number facts?
- Using the relationship between multiplication and division?
- Some other way?

How does the child record simple division?

- By drawing a picture?
- By some other informal approach?
- By using the division sign (÷)?
- By some other formal approach?

How does the child solve more difficult division problems?

Do the strategies used differ from those previously displayed?

How does the child solve problems when the solution involves remainders?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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DIVISION 2

AIM

To explore the child's level of operation in relation to the partition (fair shares) aspect of division.

MATERIALS

Readily available counting materials or objects around which a story problem could be created.

INITIAL ACTIVITY

Use a story problem to present a simple partition division situation. For example, 'I have 12 wheels. I want them to be shared between three people. How many wheels would each person get?

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child recognise this as a 'fair shares' situation?

Does the child model the situation in any way?

If so, how does the child do this:

- By using objects?

Does the child share all the objects one by one or by making some sharings larger? For example:

First round: one for you, and one for you, and one for you.
Second round: two for you, and two for you, and two for you.
Third round: one for you, and one for you, and one for you.

- By drawing?

Does the child use a mental strategy to solve the problem?

What strategy does the child use:

- Visualising the situation?
- Addition or subtraction of equal groups?
- Knowledge of the appropriate number fact?
- Using the relationship between multiplication and division?
- Some other way?

How does the child record this form of division?

- By drawing a picture?
- By some other informal way?
- By using the division sign (÷)?
- By some other formal way?

How does the child solve more difficult 'fair shares' problems?

Do the strategies used differ from those previously displayed?

How does the child resolve a situation which involves remainders?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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MULTIPLICATION

AIM

To establish the child's level of operation in relation to multiplication.

MATERIALS

Counting materials — buttons, bottle-tops, Unifix blocks.
Recording materials — pencils, paper.

INITIAL ACTIVITY

Use a story problem to present simple multiplication. For example: 'There were three people sitting at the wharf. They each caught five fish. How many fish were caught altogether?'

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child use the materials to model the situation?

If so, how were the materials used? Ask the child to talk about the model. Does the child talk in terms of repeated addition (five fish and five fish and five fish); or lots of/groups of (three lots of five)?

Does the child use a mental strategy?

Ask the child to explain how the answer was arrived at.

How does the child record multiplication.

- By drawing a picture?
- By some other informal method?
- By repeated addition?
- By using the multiplication symbol?

Does the child associate multiplication with a situation showing rows and columns (an array)?

Show the child an array and ask the child to tell you how they would find out how many pegs, for example, are shown.

How does the child find the total number:

- Count each peg?
- Add each row or column?
- Multiply the number of rows and columns?
- Some other way?

Does the child use the commutative property of multiplication?

Rotate the array a quarter turn and ask how many pegs there are now. How does the child solve the problem? Does the child recognise a relationship between the two arrays?

What strategies are used to multiply a two-digit number by a single-digit number?

For example: 3 x 23 and 5 x 23.

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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SUBTRACTION 1

AIM

To establish the child's level of operation in relation to simple subtraction involving a 'take-away' situation.

MATERIALS

Readily available counting materials such as buttons, counters, Unifix blocks. Recording materials — pencils, paper, number tickets.

INITIAL ACTIVITY

Use a story problem to present a simple 'take-away' situation. For example, 'You have nine coloured pencils in a pencil-case. If you lent three to a friend, how many pencils would be left in the pencil-case?'

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OBSERVATIONS AND FURTHER ACTIVITIES

Does the child recognise that this is a subtraction situation?

Does the child use the counting materials to model the situation?

If so, how are they used:

- Is some of the material removed and the remainder counted?
- Does the child count back while removing objects?
- Does the child count back without removing objects?
- Does the child use the material in another way?

Does the child draw a picture to help find a solution?

Does the child work out the answer mentally?

If so, it is important to ask the child to explain the process used. How does the child find the solution?

- by counting back mentally?
- by 'just knowing the answer' (automatic response)?
- by using some other knowledge? For example: 'I know 10 take away 3 is 7, so 9 take away 3 will be 6'; or, 'I know that 3 and 6 is 9, so 9 take away 3 will be 6.'

How does the child find solutions for a range of more difficult problems?

(i) 14 - 8
(ii) 18 - 5
(ii) 22 - 7

Does the child use different strategies for different situations?

How does the child record simple (take-away) subtraction?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

SUBTRACTION 2

AIM

To explore the child's undertanding of the comparative aspect of subtraction (difference).

MATERIALS

Counting materials — buttons, blocks.
Objects around which a story problem could be set — model cars, logic people, animal shapes.

INITIAL ACTIVITY

Use a story problem to present this type of subtraction situation. For example, 'Kristy has six cars and John has four cars. How many more cars does Kristy have than John?'

OBSERVATIONS AND FURTHER ACTIVITIES

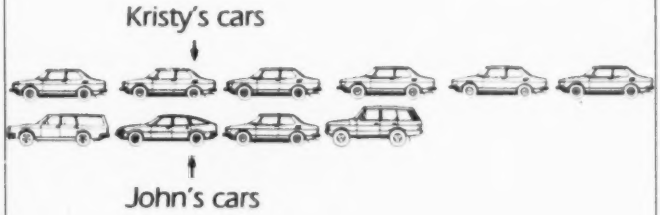
Is the child able to identify which group has more and say how many more there are?

Is the child able to identify which group has fewer and say how many fewer there are?

How does the child find the difference?

- By modelling the situation with actual objects or other counting material?

  Does the child pair off objects from the two sets and then refer to those objects unpaired?



  Does the child compare the sets some other way?
- By counting on or back?
- By some other way?

How does the child record what has been done?

How does the child solve more difficult problems of this type?
Is the same strategy used as for the less difficult situation?

Does the child recognise that these are subtractions?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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SUBTRACTION 3

AIM

To observe the strategies used by the child when subtracting two-digit numbers and, later, three-digit numbers.

MATERIALS

Grouped (into tens) and loose material such as Unifix blocks, Dienes blocks, pop-sticks.
Recording materials — pencils, paper, number tickets.

INITIAL ACTIVITY

Either present a subtraction situation in a story problem and ask the child to solve it; or ask how the child would find the answer to a problem such as: 37 - 15.

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child use the counting materials?

If so, how are the materials used:

- Is the larger number modelled with single items, some items removed and then the remainder counted?
- Is the larger number modelled with groups of ten and units, some of the material removed and the remainder counted?
- Is the larger number modelled in one of the above ways, and counting-back used?
- Is it modelled some other way?

Does the child find the answer using a pencil-and-paper method?

If so, what method does the child use:

- A conventional setting out?
- Some less conventional method?

Does the child use a mental strategy to find the answer?

What strategy does the child use:

- Counting back from one number?
- Subtracting the units, then the tens?
- Subtracting the tens, then the units?
- Some other way, for example, adding on from the smaller number?

How does the child record the subtraction of two-digit numbers?

What strategy does the child use to solve subtraction problems which involve re-grouping?

Does this differ from the previous approach?

What strategies are used by the child when subtracting three-digit numbers?

Do the strategies differ from those used to subtract two-digit numbers?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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ADDITION 1

AIM

To establish the child's level of operation in realtion to simple addition.

MATERIALS

Readily available counting materials such as buttons, counters, Unifix blocks.
Recording materials — pencil, paper, number tickets.

INITIAL ACTIVITY

Use a story problem to present a simple addition situation. For example, 'On your birthday your big sister gave you four rubbers and your little brother gave you three more rubbers. How many rubbers were you given altogether?'
It may be necessary to give the child some prompts, such as, 'Will the counters help you?'

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child recognise that this is addition?

Does the child use the counting materials?

If so, how are they used?
- Are both sets modelled?
- Are the sets combined, or left separate?

How are the objects counted?
- All objects counted.
- Counting-on is used, for example:

○ ○ ○
5 6 7

Does the child draw a picture to help find a solution?

Does the child give the answer without using materials?

If so, it is important to question the child to reveal the mental processes used.

How does the child find a solution?
- By counting-on mentally?
- By 'just knowing the answer' (automatic response)?
- By using some other knowledge, for example, 3 and 3 is 6, so 4 and 3 must be 7?

How does the child find a solution for a range of more difficult problems?

Use these examples:

(i) 8 + 6 (iii) 15 + 2 + 1
(ii) 13 + 5 (iv) 15 + 7

If the child gives an answer without using materials ask the child to explain how the answer was worked out.

How does the child record simple addition?

- Draw a picture and perhaps include some numbers?
- Write numbers only, for example, 4 3 7?
- Write a descriptive story?
- Use cards to make a statement?

For example | 4 | and | 3 | → | 7 |

- Write an equation, for example, 4 + 3 = 7?
- Some other way?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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ADDITION 2

AIM

To observe the strategies used by the child when adding two-digit numbers and, later, three-digit numbers.

MATERIALS

Grouped (into tens) and loose material such as Unifix blocks, Dienes blocks, pop-sticks.
Recording material — pencil, paper, number tickets.

INITIAL ACTIVITY

Either present an addition situation in a story problem and ask the child to solve it, or ask the child to find the answer to a problem such as: 25 add 33.

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child use the counting materials?

If so, how are the materials used:

- both numbers modelled with single items, then all counted?
- the numbers modelled with groups of ten and units, then totalled?
- some other way?

Does the child find the answer using a pencil-and-paper method?

If so, what method does the child use:

- A conventional setting out?
- Some less conventional method?

Does the child use a mental strategy to find the answer?

What strategy does the child use:

- Counting on from one number?
- Adding the units, then the tens?
- Adding the tens, then the units?
- Some other way, for example:
  25 + 33 → 25 and 3 is 28, 28 and 30 is 58.

How does the child record the addition of two-digit numbers?

- By the use of drawings and/or number tickets?
- By a 'horizontal' number sentence?
- By vertical setting-out?

What strategy does the child use to solve addition problems which involve regrouping?

Does this differ from the previous approach?
Some children will out-grow the need to write 'carrying' numbers when recording addition with regrouping.

What strategies are used by the child when adding three-digit numbers?

Do the strategies differ from those used to add two-digit numbers?

Does the child approach the task with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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SORTING AND CLASSIFICATION

GENERAL STATEMENT

> Classification is the earliest stage of logical thinking and the foundation for an understanding of complex mathematical ideas. (Burton, 1985).

It is a social activity. Teacher and group modelling of appropriate sorting activities are valuable experiences for children having difficulties. These activities should be accompanied by discussion.

AIM

To establish the child's level of understanding and application of classification.

MATERIALS

Containers of selected objects from both fabricated and environmental materials — bottletops, old keys, buttons, unshelled nuts, shells, leaves.

INITIAL ACTIVITY

Ask the child to choose a container of objects to sort.

Try to engage the child in some dialogue so that the child's thinking is revealed. For example: 'Where will you put this one?' 'Would you tell me why it belongs with that group?'

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child show enthusiasm, creative thinking, perseverance? Does the child decide on the categories for sorting quite readily?

Do you think that there is a need to give some suggestions, for example, 'What about sorting the things by the way they feel?'

Do the objects in each group the child makes, have attributes in common?

Is the child able to justify decisions?

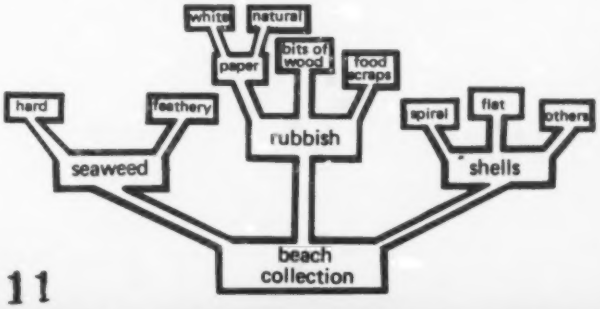
After deciding on sorting criteria does the child keep to them?

How has the material been sorted?

- into two categories or sub-sets, for example rough and smooth, big and small, like and don't like;
- into a number of sub-sets but by one property only, for example colour, size, texture;
- into a number of sub-sets and by more than one property, for example round with four holes;
- some other way.

Is the child able to sort the sub-sets?

Indicate one particular sub-set and ask the child to sort those things into groups. After discussion ask the child to sort the remaining sub-sets. An example of this 'extended' sorting is shown.



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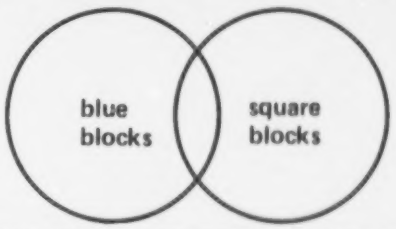
Can the child re-sort the same collection in a different way?

Can the child identify how someone else has sorted a collection?

Begin to sort a collection and then ask the child to continue the sorting. Ask the child to explain the principle of the sorting.

Can the child accept that, in some instances, an object can have the attributes of more than one set?

When sorting, a child may be faced with this situation. Encourage the child to suggest ways to solve the problem. You may wish to introduce the intersection of sets by overlapping two hoops.



Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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ONE-TO-ONE CORRESPONDENCE

GENERAL STATEMENT

Children need a lot of experience matching and rearranging sets before the idea of conservation or invariance of a number or quantity is established. It is acquired slowly through experience.

(Avelyn Davidson, 1984)

AIM

To establish the child's understanding about putting two groups into one-to-one correspondence.

MATERIALS

There are two types of material that could be considered:

- Material where there is a correlation between the two sets — cups and saucers, cars and garages, bowls and spoons.
- Material where there is no correlation — buttons, blocks, beads, counters.

Initially two equal sets of material will be needed — about six to eight items in each set. For further activities it will be necessary to have more of the items available.

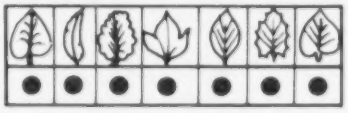
INITIAL ACTIVITY

Either provide the child with two sets of objects or seize an opportunity when the child is working with appropriate materials. The directions should relate directly to the materials being used, for example, 'Can you match the cups with the saucers?', 'Put a bead with each shell.'

OBSERVATIONS AND FURTHER ACTIVITIES

Was the pairing process satisfactorily carried out?

- If so, ask the child to talk about what has been done. Does the child describe the relationship between the two sets?
- If not, note what the child did and said. Some children find the pairing process difficult because of spatial problems, particularly if there is a marked difference in size between the objects in the two sets. The use of grids may help.



Does the child have the idea of 'lasting equivalence' or conservation when the objects in one set are rearranged?

Is the child able to compare two sets which do not have the same number of objects in each set?

- How does the child make the comparison between the two sets — by pairing, by counting?
- Does the child describe the relationship between the two sets?

Can the child alter the number of one set to establish an equality relationship?

- Ask the child, for example, 'Can you change what is on the table so that there are as many__as__?' (It will be important that more items of each set are available to the child.)
- Is the child able to make the two sets the same size? If so, how was this done? It may have been done, for example, by removing the unmatched objects in the larger set.
- Does the child describe the relationship between the two sets?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

BEST COPY AVAILABLE

Note what the child does and says.
What implications are there for further teaching?

PATTERN

GENERAL STATEMENT

> A pattern is formed by the repetition of some recognisable and predictable arrangement of elements. The ability to recognise, analyse and predict from patterns is an essential part of learning. (Dora Scales, 1981)

Pattern-making and recognition should be an enjoyable activity, accompanied by discussion.

AIM

To establish the child's level of understanding and application of pattern-making.

MATERIAL

Containers of selected objects — both fabricated and from the natural environment — bottle-tops, keys, buttons, shells, leaves, sticks, unshelled nuts.

INITIAL ACTIVITY

Ask the child to select some materials and use them to make a pattern.

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child make a recognisable pattern?

If not, it will be important to ask the following questions about pattern to reveal the child's thinking:

- Is the child able to recognise a pattern made by the teacher or another child, or a pattern which may be on display?
- Can the child copy a pattern?
- Can the child 'read' a pattern, for example, 'Rock, shell, rock, shell, rock . . .'? It may help the child to verbalise the repeating nature of the pattern if the repeated elements are separated:

○△□ ○△□ ○△□

If so, it will be important to ask questions about pattern to reveal the child's thinking. For example:

- 'What makes it a pattern?' Does the child communicate in some way the idea of the repetitive nature of pattern?
- 'What are you repeating?'
- 'Where does the part you are repeating start and finish?'
- 'How many times does it repeat?'

The complexity of the pattern made by the child should be noted. The simplest pattern uses just two alternating elements: A B A B A B

Examples of other linear pattern types are:

i ABC ABC ABC
ii AAB AAB AAB
iii ABB ABB ABB
iv ABBC ABBC ABBC
v ABAC ABAD ABAC

Is the child able to extend different types of pattern?

Pose challenges such as, 'Can you make your pattern as long as the table/your arm?'

Is the child able to complete patterns which have missing parts?

The degree of difficulty of this task varies according to the complexity of the pattern and to the number of elements that are missing from the pattern.

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Does the child create and describe a range of pattern types with ease?

Patterning can include visual, auditory, tactile and movement experiences, all of which should encourage discussion, prediction, creativity and enjoyment.

Is the child able to discuss similarities and differences between patterns?

Ask questions such as:

- 'What is different about the second pattern?'
- 'Are the two patterns the same in any way?'
- 'How is the pattern you see like the pattern you hear?'

Can the child transfer patterns from one form to another?

(a) Using different colours or different materials:

Original pattern

ABB ABB A

Same pattern using different materials

(b) Using auditory or movement patterns:

snap clap stamp snap clap stamp snap

Does the child create border and 'all-over' patterns?

These may be more readily seen during creative activities in the art area.

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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ORDERING

GENERAL STATEMENT

> The ability to place objects in order according to a given or chosen criterion is a necessary prerequisite to dealing with the more abstract ordering of numbers and to thinking in terms of relations. (Elkind, 1974)

Children develop the ability to seriate efficiently through experience with a wide variety of interesting materials, and when the number of items to be ordered is gradually increased. These activities should be accompanied by lots of discussion.

AIM

To establish the child's level of understanding of ordering objects.

MATERIALS

Containers of selected materials suitable for ordering by length, width, height, diameter, tone, weight and hue. Such materials could include cylinders of graduated heights, nesting cups, Cuisenaire rods, books, jar lids, sticks, leaves.

INITIAL ACTIVITY

Ask the child to choose a container of materials and put the contents in order. Some prompting may be necessary, depending on the material selected.

OBSERVATIONS AND FURTHER ACTIVITIES

Does the child have an early notion of ordering?

For example:

- Perhaps the child makes small groupings and orders the objects in each group.
- Perhaps the first two and last two items are identified but the other items between these are not ordered.

Are all the items ordered correctly?

Note the direction of ordering. Is it largest to smallest or the reverse? Ask the child to talk about what has been done.

Can the child insert another object into the sequence?

Give the child another object similar to the material being used and ask for it to be placed in the order.

Is the child able to order the material another way?

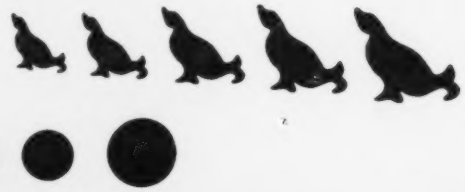
For example:

- largest to smallest or the reverse;
- in directions other than left to right;
- starting with an item from the middle of the order.

Give the child one item from the material. Ask the child to order the material starting with that piece and using all the pieces.

Can the child order two sets of objects and co-ordinate the orderings with each other (double seriation)?

This is very challenging for young children. In the early stages at this level, a correlation between the two sets will often give more meaning to the activity for the child.



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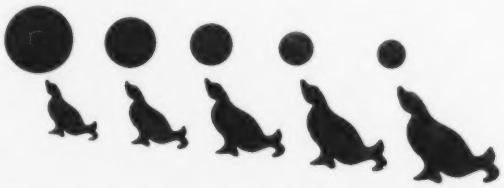
Using the material illustrated, some questions might be:

- 'Which ball would the smallest seal have? Now give the other seals a ball each.'
- 'Which seal would get this ball?' (Pointing to any ball.)

Can the child match the largest of one ordered set with the smallest of another (reverse-double seriation)?

Having ordered the set of seals and the set of balls, for example, ask the child to give the smallest seal the largest ball. Ask, 'Which ball would the next seal get? Now give the other seals a ball each.'

Encourage the child to talk about the activity.



Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

COUNTING 1

AIM

To explore the meanings that the child has constructed about counting.

MATERIALS

Objects suitable for counting — shells, gumnuts, bottle-tops, Unifix cubes.

INITIAL ACTIVITY

Ask the child to take a handful of the objects and count them.

OBSERVATIONS AND FURTHER ACTIVITIES.

Does the child say the counting words in correct sequence?

If not, what sort of sequence does the child use?

- Random and unstable, that is, using an unconventional sequence, and a different sequence each time.
- Stable but unconventional, that is, repeatedly using the same unconventional sequence, for example, 1, 3, 4, 5, 2.
- Conventional and stable sequence, up to a certain point. At what point does the sequence break down?

Does the child count the objects by assigning each object an individual number name (that is, counting with one-to-one correspondence)?

Is this application of one-to-one correspondence affected by different arrangements? For example:

(i) ●●●●●●●●

(ii)

(iii)

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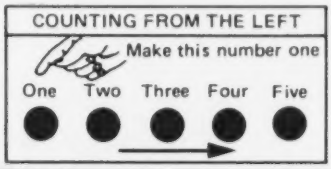
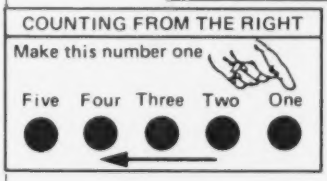
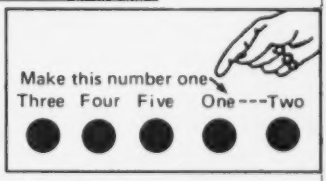
Is the child aware that the last number said in the counting sequence will indicate the 'manyness' of the whole group?

What is the child's response to the question, 'How many____are there?' Does the response indicate that the child is paying attention to the 'manyness' of the group?

Does the child have the expectation of producing the same result regardless of the direction taken to count the arrangement?







Is the child able to make a set of any given number?

For example, 'Would you pass me nine pegs please?'

If the objects are rearranged, does the child expect the quantity to remain constant (conservation of number)?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

COUNTING 2

GENERAL STATEMENT

The use of numerals is an end point. It follows after the concept of number has been established through many concrete experiences accompanied by much discussion.

AIM

To explore the child's recognition and understanding of numerals.

MATERIALS

Quantities of objects of different types for sorting.
Prepared number tickets.

INITIAL ACTIVITY

After the child has sorted the objects (using the child's own criteria), ask the child to put an appropriate number ticket with each group.

OBSERVATIONS AND FURTHER ACTIVITIES

Is the child able to put the appropriate number ticket with each group?

How does the child explain these decisions?

Is the child able to put the appropriate number of objects with given tickets?

If you indicate one of these groups and ask 'How many are there?', how does the child respond?

- By counting all the objects again?
- By reading the number ticket?
- Some other way?

What numerals does the child recognise?

Is the child able to put these numerals in order?

- From least to greatest?
- From greatest to least?

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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COUNTING 3

AIM

To observe the counting strategies used by the child when counting on or back from a given number.

MATERIALS

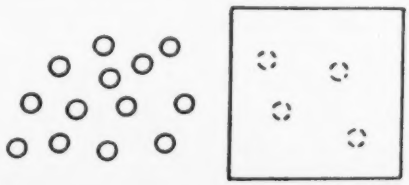
Objects suitable for counting.
A piece of card to cover objects.

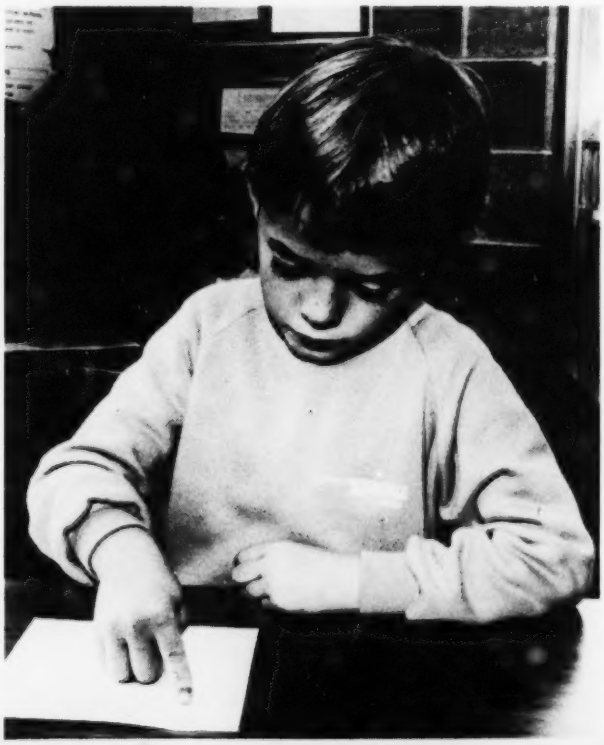
INITIAL ACTIVITY

Count out a number of objects and have the child confirm the quantity. Explain to the child that some of the objects are going to be covered up.

How many objects are still showing?

How many are hidden?





OBSERVATIONS AND FURTHER ACTIVITIES

Does the child re-count the visible objects and then,

- count on, pointing or nodding at the expected position of the hidden objects?
- count on, saying counting words?
- raise or tap fingers in synchrony with each number name until the total is reached?

Does the child state the number of visible objects and then,

- count on, pointing or nodding?
- count on, using counting words only?
- raise or tap fingers in synchrony with each number name?

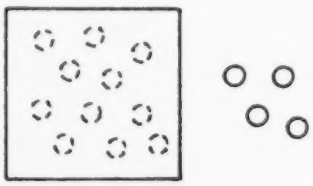
Does the child count backwards until reaching the covered objects to arrive at an answer?

Does the child use some other strategy?
If the strategy is not immediately obvious, ask the child to explain how the given answer was arrived at.

Is the child able to use an alternative strategy to check the original answer?

What strategies does the child use when the larger quantity is covered?

For example:



Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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COUNTING 4

AIM

To explore the child's understanding of 'more than', 'less than' and 'between' in relation to numbers.

MATERIALS

Unifix blocks, gum nuts, bottle tops or objects of a similar size.
Number tickets.
Smaller objects, e.g. buttons, counting sticks, tiddly-winks, will be needed for later activities.

INITIAL ACTIVITY

Ask the child to take a handful of the objects and to give another handful to the teacher or a friend.
Pose a challenge that will require the child to compare the quantity in the two groups, e.g. 'Guess which group has more/fewer? How will you find out? Show me.'

OBSERVATIONS AND FURTHER ACTIVITIES

How does the child compare the two groups?

- Uses a pairing process (1:1 correspondence) to compare the two groups.

Does the child arrange the objects in organised rows

or in random pairings?

Is any counting used?

- Counts the two groups and uses number knowledge to compare them.

Does the child describe the relationship between the two groups?

Can the child make a group that would be between the two groups?
Ask the child to explain the answer.

What strategies does the child use if larger quantities are involved?
Compare handfuls of smaller objects.

Is the child able to compare quantities when only written numbers are involved?
e.g. [34] [29] Which is more/less?
Repeat with other tickets [27] [38]
Find a number ticket that would come between these two numbers.
Explain why that particular ticket was chosen.

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

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COUNTING 5

AIM

To observe the counting procedure used by the child when counting a larger collection.

MATERIAL

Containers of materials suitable for counting — buttons, bottle-tops, gumnuts. Limit the quantity in each container to a reasonable number, keeping in mind the child's concentration span and interest in the task.

INITIAL ACTIVITY

Ask the child to choose a container. Encourage the child to estimate how many objects are in the container, then to check the answer.

OBSERVATIONS AND FURTHER ACTIVITIES

If the strategy used to count the objects is not obvious, ask the child to explain how the set was counted. For example, ask, 'Would you show me and tell me what you did so I can understand your counting?'

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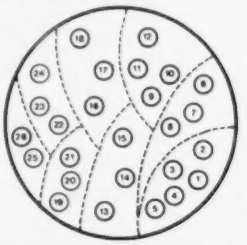
How does the child count the collection?

- Is the count accurate?
  If not, at what point did the accuracy cease?
- Does the child count each item with a one-to-one correspondence?
- Does the child count with one-to-one correspondence but recognise small groups of two, three or four, as in this diagram?

The size of the grouping is not uniform; it is based more on the spatial arrangement of the material.
(Labinowicz, 1985)



- Does the child make equal-sized groupings and count after making the groups, or does the child count as the groups are made?
- Is the child able to co-ordinate the number sequence with the groups?

5 10 15 20 23

This is a one-name-to-many-objects correspondence.

Is the child able to count the objects another way, for example, by other groupings?
Does the child expect to arrive at the same answer each time?

If the objects are re-arranged, does the child expect the quantity to remain the same?

Does the child seem at ease when asked to make an estimate?

Does the child show confidence in using the counting procedure?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?

AIM

To explore the child's understanding of the structure of two-digit numbers.

MATERIALS

Large quantity of objects which can be bundled or clipped into groups of ten, such as pop-sticks, pencils, Unifix cubes. (Have some of the material already grouped into tens.)
Set of cards, each one numbered with a digit from zero to nine.

INITIAL ACTIVITY

Have the child confirm the size of the ready-made groups of ten and then ask for help to construct a few more of these groups.
Ask the child to 'make' a number, such as 54.

OBSERVATIONS AND FURTHER ACTIVITIES

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Is the child able to represent the number in some way?

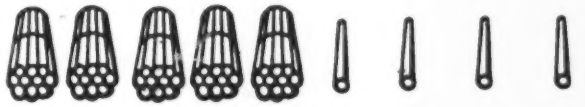
How does the child represent the number?

- Does the child model the number with single objects? Are there any grouping strategies evident? Ask the child to make the number another way and observe what the child does.
- Does the child use bundles of ten and single items to model the number?

If the number is modelled with bundles of ten and single items how are the bundles counted?

- by tens?

- by ones, realising that each bundle represents one ten?



- some other way?

Can the child select the appropriate number cards to represent the number modelled?
For example 5 4
Ask the child to explain the reasoning.

If the teacher models a number, can the child say what the number is?
Ask the child to explain how the given number was arrived at.

Can the child read and model a number when shown the numeral?
For example: 2 8 'What number is this?' 'Show this number with the sticks.'

Can the child recognise number words?
For example: fifty-four
(Use when appropriate)

Does the child approach the tasks with confidence?

RECORD YOUR OBSERVATIONS

Note what the child does and says.
What implications are there for further teaching?